



# Process Approach as the Basis for Digital Transformations in Transport and Logistics Business



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## ABSTRACT

Process management raises the level of technological development of the transport system, serves as the basis for digitalisation of passenger and cargo transportation, reduces costs, improves reliability, safety of infrastructure and vehicles, as well as environmental friendliness of the transport.

Digital technology provides an opportunity to restructure production systems of all sectors of the economy to improve interaction with customers, employees, and ecosystem partners, as well as to reduce costs.

To build a new operating model, it is necessary to identify losses in existing processes and seize the opportunities offered by digital transformation.

The article discusses the main methodological gaps in the transformation of the process architecture of companies, considering the features of large holding-type structures. The objective of the study is to determine the directions of transformation of the process architecture of transport companies.

The article proposes to evaluate the level of digital maturity of processes based on the deviation from target values of two of its indicators: the level of automation and the level of digital trust.

The need to systematise the methodological aspects of the transition to a process type of management in transport companies through business process reengineering determines the relevance of adapting applied tools and methods of its application.

**Keywords:** transport, digital transformation, enterprise business architecture, metrics of technological progressiveness of processes.

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## INTRODUCTION

Process management has become widespread in the transport industry. It facilitates the adoption of new technologies, serves in general terms as an effective basis for improving technological maturity of transport processes, as well as helps to reduce costs, increase reliability, environmental friendliness, and sustainability of the transportation industry. The process approach creates a favourable environment for digitalisation of transport activities, passenger and cargo transportation, maintenance, and development of infrastructure. In turn, digital technology makes it possible to restructure and, if necessary, modernise industrial relationships, strengthen customer focus, and the effectiveness of interaction with partners and employees, that is, all participants in the transport ecosystem. Thus, there is an obvious relationship between process management and digital transformation processes. Due to their mutual influence, prerequisites are created for formation of a new operating model. However, for its effective development, it is necessary to identify shortcomings and losses in existing processes and effectively implement the capacity of digital transformation. To do this, it is necessary to consider the key methodological gaps that occur in the process of restructuring the process architecture of transport companies, which are especially fundamental in holding-type companies.

The *objective* of the study is to determine the direction of transformation of the process architecture of transport companies.

The main *methods* used in the study are synthesis and decomposition of the conceptual framework, analysis of creation of added value within the processes of a transport company, dynamic modelling of process parameters, analysis of redundant elements and bottlenecks in the business architecture of a transport company.

## RESULTS

### Business Architecture: Concept and Value

Enterprise Business Architecture (EBA) is an area of management activity that relies on the mission and system of goals of an organisation, critical success factors, business strategies, description of functions, as well as the on structures and processes necessary for implementation of functions. The architecture of business processes is determined by the main

functions of the organisation and may change under the influence of changes in the external environment, as well as because of adaptation to new technologies and products introduced by the company.

«Building a business architecture of an enterprise at the top level implies an analysis of the main functions (chains) of creation of added value (Value Landscape Analysis), Business Scenario Models, analysis of information links and processes (Information Value Chain Analysis)» [1].

The system basis of the enterprise business architecture includes Function / Process Decomposition, Business Event Analysis, Location Model, Integration Model.

Currently, there are various methods for describing the enterprise business architecture. John A. Zachman created an architecture modelling worksheet, recognized as the Zachman Framework<sup>1</sup>, which is quite applicable to the analysis and transformation of the process architecture of a transport company [2]. The framework was first proposed in 1987, its second edition appeared in 1992. For ease of description, Zachman proposed the so-called Zachman Framework for Enterprise Architecture. The enterprise ontology is focused on achieving two main goals: on the one hand, to logically decompose the description of the business architecture into separate sections to simplify their formation and perception; on the other hand, to provide an opportunity to consider a holistic architecture from the standpoint of the value of individual business components. The Zachman framework includes descriptive areas:

- Data used [data].
- Processes and functions [function].
- Location of execution of processes [network].
- Participants in the execution of processes [people].
- Controlling events [time].
- Goals and constraints that determine operation of the system [motivation].

Historically, the Zachman model was first created specifically for IT systems and to this day remains an important tool for designing,

<sup>1</sup> Zachman, J. A. The Framework for Enterprise Architecture: Background, Description and Utility by: John A. Zachman. [Electronic resource]: <https://www.zachman.com/resources/ea-articles-reference/327-the-framework-for-enterprise-architecture-background-description-and-utility-by-john-a-zachman>. Last accessed 25.12.2021.

analysing, and transforming business architectures. There are several modifications there-of developed by other researchers.

The TOGAF (The Open Group Architecture Framework) for the description of the architecture has also become widespread. The TOGAF model includes as its main component the Architecture Development Method (ADM), which defines the architecture development process, which consists of several phases:

- Phase A: definition of the boundaries of the project, development of a vision of the architecture; approval of the work plan and of general approach of the management to its implementation.

- Phase B: development of the business architecture of the enterprise.

- Phase C: development of data architecture and application architecture.

- Phase D: development of technological architecture.

- Phase E: verification of feasibility of the implementation of the proposed solutions.

- Phase F: planning of the transition to the new system.

- Phase G: formation of a change management system.

- Phase H: architecture change management.

Principles governing the architecture are fundamentals that are used as «starting points» both for assessing the existing process management system and for developing individual solutions in the field of business digital transformation. The application of the architectural approach allows achieving the following business transformation values: consistency of transformation of both the IT and business models, controllability of changes, development of high-quality documentation on changes in technology, standardisation of operations, taxonomy completeness.

Once architecture models have been created, various analysis methods, based on differentiated methods, can be applied. They can include:

- Analysis of value chains.
- Dynamic modelling.
- Gap-overlap analysis.
- Activity-based costing.
- Analysis of the total cost of ownership of the process.
- Assessment of return on investment.

Such models usually are directly related to the process of generation of the architecture of applications, as it is expected in the approach to

development of the business process model-driven architecture.

### **Comparison of Business Processes and Digital Transformation Processes**

Digital transformation does not refer to individual processes, but to the work of the integral organisation. This is a change in the development strategy, business model (business conduct model), and business architecture, product (service) line and sales channels, corporate culture based on advanced technological solutions and digitalisation. Digitalisation processes are not processes of managing the IT infrastructure of an organisation, but all the processes of an organisation (in the broad sense) that are performed completely automatically, or whose level of automation is more than 80 %. This includes processes for commercialisation of products and services, supporting and managing processes (Table 1).

The most important factor in achieving effectiveness of digital transformations is the elimination of duplication losses in the processing of information flows generated by various information systems.

To eliminate these losses, digital platforms are becoming the preferred and dominant business model for many industries, including the transport sector of the economy. In the transport industry, competition from different modes of transport results in changes in the traditional value chain of transporting goods and passengers. Besides, it becomes more difficult to promote traditional transportation products and services that are not complemented by operations that provide a full cycle of the transportation process using various modes of transport and including insurance, storage, transshipment, and other services. The modern transport market is generating increasingly complex and more expensive operating models. Consequently, many leading companies are shifting from a product orientation to a customer orientation, focusing on providing a differentiated customer service in target markets [4; 5].

Another important factor is changing customer behaviour. When choosing a provider of transport and logistics services, customers are guided by the capabilities of digital platforms. Therefore, transport companies must position themselves as a digital service that is convenient for customers and create an appropriate digital transformation strategy that provides proposals



Table 1

### Elements of process models: similarities and differences [compiled by the authors]

No.	Elements	Business processes	Digitalisation processes
1	Sources of information for development of process models	Interviews of employees (performers). Value stream mapping. Technical documentation	Study of the company's IT architecture, documentation on industrial automated systems
2	Notations for graphic description of processes	IDEFO, Cross Functional Flow Chart, EPC (event-driven process chain)	BPMN (business process model and notation), ArchiMate, UML (unified modelling language)
3	Management	Each process has an owner and a process team (workgroup)	Single owner and single team of digital transformation management manage reengineering of a large group of operational processes
4	Documentation	Detailed regulations and instructions for employees on implementation of processes	Terms of reference on digitalisation of processes
5	Company business architecture	Not required, or only fragments	Required at scale of the whole company
6	Information flows	Predominantly paper documents on processes	All information flows are implemented in digital format
7	Quality and efficiency of processes	Achieved through training and motivation of performers (employees), monitoring of implementation of regulations	Achieved through risk management and standardisation of all components of the IT architecture
8	Internal indicators of processes	Determined by using the optimal number of personnel (performers)	The level of automation and the level of information processing of end-to-end processes without duplication
9	Functional cost analysis of processes	Estimated costs for implementation of the process. The main results of the process.	Digital service maintenance costs

for improving customer service and achieving strategic goals.

Digital platforms, by forming partnerships with various companies, create an ecosystem that brings together customers and providers of transport and logistics services, as well as other participants in the transport market. The value of an effective relationship based on a digital platform grows as the number of participants increases.

For a formalised description of business processes and digital transformation processes, it is possible to use standard business modelling tools like Microsoft Visio and Excel, Business Studio, as well as SILA, Russian domestic product. They allow analysing the main (product), supporting and managing processes, as well as reengineering them, redistributing the load between processes and ensuring elimination of redundant, duplicate processes due to digital transformation.

### Metrics of Technological Progressiveness of Processes

The development of process architecture and its compliance with the current level of business

and the turbulence of the surrounding digital environment are proposed to be associated with indicators of technological progressiveness of processes. *Technological progressiveness* is proposed to be called the compliance of the process architecture of an enterprise with the main vectors of development of transport systems. In the Russian Federation, these vectors are rightfully determined by such priorities of the Transport Strategy of Russian Federation<sup>2</sup> as digital transformation of the transport industry and reduction of harmful effects of transport on the environment.

It is proposed to assess the implementation of digital transformation in the processes of transport companies based on the compliance of the digital maturity of processes with the reference level, which can be measured by the following metrics:

- Level of process automation.
- Degree of digital trust.

The simplest way to calculate the level of

<sup>2</sup> Transport strategy of the Russian Federation until 2030 with a forecast for the period until 2035, approved by the Decree of the Government of the Russian Federation dated November 27, 2021, No. 3363-r. [Electronic resource]: <https://mintrans.gov.ru/documents/8/11577>. Last accessed 25.12.2021.



process automation is to estimate the number of process operations performed by IT systems in relation to the total number of operations in the process.

A more accurate analysis can be made by developing a rating scale in points to assess deviations of process automation from the target value. For each technology of process implementation, in this case, it is necessary to set the scoring value in the range from «0 points» (the process or subprocess is performed manually) to «5 points» (fully automated execution). The target value in this study is determined at the level of maturity which is equal to «5 points».

If the process consists of  $N$  subprocesses, then the average value of the automation level ( $s_k$ ) of the  $k$ -th process is determined by the formula, considering the equal significance of each process:

$$s_k = \frac{1}{N} \sum_i (5 - F_i^k), \quad (1)$$

where  $F_i^k$  is the resulting score of the level of automation of the  $i$ -th process.

It is by the magnitude of the deviation that it is proposed to evaluate primarily the compliance of the process automation level with the target value

To determine the level of automation, the metric of the ratio of automatically processed information or documents to the total volume of processed information or documents for the period, as well as the ratio of the number of transactions in the process performed fully automatically to the total number of transactions or process instances for the period, can also be used.

The automatic execution of the process may require the intervention of a specialist in case of unformatted input of data from the part of a client, faults in operability of digital services, and other types of operational risks.

One of the most pressing issues related to such digitalisation of processes in development of process architecture is creation of a digital environment of trust, which is expressed in the presence of certain principles, such as data security and protection, and their confidentiality. We can say that it is also expressed in the confidence of users in the security of personal data stored on certain digital platforms [6].

To quantify the level of digital trust, the approach based on deviations from the target level, reflected in formula (1), can also be used. In this case, the target state may be assessed by «5 points» which means full digital trust.



The main measures to ensure trust in digital services are:

- Development of cybersecurity measures to prevent the possibility of hacks of information systems and data transmission channels and various criminal activities.

- Improving the quality of testing of digital platforms and applications.

- Promoting the possibilities of using digital technologies.

- Raising the level of legal culture of customers and providers of transport and logistics services.

- Expanding the possibility of using Internet technologies.

- Development of artificial intelligence systems and digitalisation.

These measures have already being fully applied and have the widest prospects for further development in the activities of transport and logistics companies [7–9].

### Environmental and System-Wide Factors

The most important factor influencing the choice of process for transformation, as well as for the very transformation of the process architecture of a transport company, is compliance with the UN sustainable development goals.

Transport and logistics companies in Russia are increasingly involved in implementation of measures to reduce greenhouse gas emissions, as well as expanding the area of assessment of key quantitative indicators of carbon neutrality of cargo transportation<sup>3</sup>. This aspect has become one of the leading factors in the activities of Russian and foreign transport and logistics companies, the subject of numerous scientific studies [10–13].

<sup>3</sup> Environmental memorandum of JSC Russian Railways. [Electronic resource]: <https://cargolk.rzd.ru/eco>. Last accessed 25.12.2021.



## BRIEF CONCLUSIONS

The comparison of the elements of business processes and digitalisation processes, allowing to classify the differences between them, does not eliminate the conclusion about the cross-influence of these two types of processes, moreover, it makes it possible to talk about their synergistic effect. Based on this, the study resulted in proposals on introduction into scientific circulation of two metrics for the correspondence of the digital maturity of processes to the reference level (the level of process automation and the degree of digital trust).

A quantitative assessment of all metrics of the technological progressiveness of the processes of the transport and logistics business will make it possible to reasonably approach digital transformations, increase their efficiency and transform the process architecture of transport companies.

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